

A Temporally Unbiased Summary Measure of Immigrant Advancement in the U.S.

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**John Pitkin, Analysis and Forecasting, Inc. [addresses]
Dowell Myers, University of Southern California [addresses]**

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ABSTRACT

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This paper introduces a new method for summarizing the pace of immigrant advancement that enables unbiased temporal comparisons. Observed average advances are greatly affected by shifts in the duration or age composition of immigrant groups and subject to large temporal biases. Also, variations in attainments possessed by different groups when first observed after arrival mean that observed status attainments do not equate to pace of *advance*. Observed attainments are thus an unreliable measure of immigrants' experience. The new method standardizes for these effects on measured advances. Increments of advance in status attainment over a decade for cohorts at different ages and stages of settlement are combined, forming an index of Expected Lifetime Advance. The method is applied to Mexican and Asian immigrants in two decades, and computed separately for status attainments in seven domains. Results show that advances for Mexicans accelerated in 6 of 7 social, economic, and civic outcomes in the 1990s compared to the 1980s. Rates of advance for Asians by contrast were much more similar across the two decades.

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In the continuing debate over U.S. immigration, much attention has been devoted to the pace at which the foreign-born advance and assimilate after arriving in the U.S., yet surprisingly little is known about the general pace of advancement or how it varies between groups and how the pace of advances by immigrants has varied between decades. As part of a NICHD-supported study of the varying tempo of immigrant assimilation, we propose a summary measure of immigrant advancement based on techniques of standardization with commonly available data.

Answers to questions about the pace of immigrant advancement, or cumulative attainment of improved status, have substantial implications for judgments of immigrant well-being or policies of immigrant integration. The pace of advancement also may have bearing for policies on immigrant admissions, in terms of numbers, origins, and characteristics and, we must assume, for the migration decisions of prospective immigrants as they weigh the potential benefits of immigration to the U.S. In order to address such questions it is necessary to have a standardized measure of immigrant advancement that is succinct, comprehensive and intuitively meaningful.

This paper proposes a new measure that summarizes the advances of immigrants with respect to selected outcome indicators across ages and stages of the settlement process during a specific period of observation. By standardizing for age and duration of U.S. residence, the measure enables consistent comparisons of rates of advance between time periods or between groups from different origins and possessing different endowments. Rates of advance are observed for distinct cohorts over a specified time interval and combined into what we term the Expected

Lifetime Advancement (ELA) index. A separate index is compiled for each criterion variable of interest for measuring immigrants' progress or status attainment. As demonstration of the new measure, we estimate the advances of immigrants to the U.S. from two origins during two decades. Advances are measured for seven indicators of cultural, educational, economic, and civic status. Taken together, the measured advances in different domains create a much fuller picture of the overall progress of particular foreign-born groups than can be obtained from any single outcome.

The chief advantage of the proposed measure is that understanding of immigrants' changes over time has been impeded by a confounding of multiple time dimensions and associated temporal variables. A wealth of empirical studies have yielded a multitude of specific measurements of immigrant status attainment or accumulated advancement. Temporal biases are especially problematic when some temporal dimensions—period, age, duration of U.S. residence, or age at arrival—are controlled but others are not. In addition, existing studies are mostly focused on a single domain of inquiry and a single time period, making comparisons between outcomes and time periods difficult. The combined effect of these limitations is to obscure our knowledge of immigrant advancement in a plethora of disjointed and inconsistent details. The result is that we are unable to answer the most basic questions, "...[H]ow are the immigrants themselves doing?" and whether immigrants have made faster or slower overall progress in different periods.

I. Advancement and assimilation of immigrants

By *advancement* we mean the progress of the foreign-born population as measured by the changes over a time interval in the status or characteristics of immigrants as they grow older and

extend their length of residence in the U.S. Our study draws upon lessons from a broad literature on immigrant status achievement. Much of this literature measures immigrants' attainments at a particular time but does not compare attainments at different times explicitly to measure advances. Among the most active contributors is the labor economist George Borjas, whose studies of immigrant wage assimilation demonstrate the importance of distinguishing between the initial status of new immigrants after entering the U.S. and their later attainments Borjas (1985, 1995). Between 1970 and 1990, initial wages of new immigrants fell,¹ and this downward shift led Borjas to argue that Chiswick's (1978) earlier estimates of wage advances, which were observed at a single point in time and based on differences among immigrants in different arrival cohorts, are too high: more recent immigrants would not attain the wages later earned by earlier arrivals because their initial wages in the U.S. were lower than those of the earlier cohorts. This decline in initial wages is attributed by Borjas to a decline in the endowments, or "quality" of more recent immigrants. Chiswick's analysis, based on a single cross-section of 1970 data, could not distinguish between initial wages after entry and subsequent advances. The general conclusion is that a minimum of two observations in time are needed to measure advances.

When comparing immigrants from different origins, Duleep and Regets (1997) find that those who arrive with less human capital and poorer endowments start with lower wages than others but make more rapid later gains in wages. This finding implies for example that the 1970-1990 declines in the mean wages of new immigrants would lead to faster increases in the mean wages of these same immigrants later in their careers.

¹ According to Borjas (1995, Table 9) there was no change between decades in the rate of advance of immigrants' wages. In the discussion, Borjas refers to the rates of wage convergence of the two decades combined, the implication being that they were equal in the two decades. However, the rate of increase of immigrants' wages appears to have varied in later years, as Borjas and Friedberg (2006) report slower wage assimilation during the 1990s.

The sole study we have found to explicitly compare the rate of advance of the wages of immigrants between decades (Borjas and Friedberg 2006), by measuring attainments at several points in time, finds that the rate of assimilation between 1990 and 2000 for one cohort of immigrants, men who arrived 1985-89 at age 25-34, was slower than for the previous cohort of the same age in the previous decade.

Many studies of immigrant progress (including Borjas and Friedberg) measure *assimilation*, or the gaps between immigrants and native-born contemporaries, in this case in wages, rather than immigrants' wages *per se*. A relative measure at once provides a standard of comparison for immigrants and a statistical control for variations in those market and other conditions which affect all wage earners. In this case, the implicit assumption is that labor market conditions affect native- and foreign-born workers equally and therefore do not influence the gap between native- and foreign-born workers. However, such measures of assimilation do not directly measure variations in the rate of immigrant advances, i.e., in real wages.

The absolute advances of immigrants, wage gains, the share who have a command of spoken English, or become citizens, or who have arrived at other status attainments, are of greater and more general interest than the corresponding gaps with the native-born population. Native-born advances offer at best an elastic standard of comparison, complicating the interpretation of measured assimilation.² Before rushing to judgments of assimilation,³ the first order of business is to adequately measure the absolute pace of immigrant advancement, which is our purpose.

² E.g., Borjas and Friedberg (p. 28) find that the acceleration of wage assimilation of low-skill immigrants in the 1990s is due entirely to a reduction in wages among native-born high-school dropouts: there were no wage gains for immigrants. Moreover, it is possible for the attainments of immigrants to exceed those of native-born peers, as has

II. Domains of Advancement

While wages have been an important focus of research on immigrants' economic success and participation in the economic mainstream, there has also been much research during the past three decades on immigrants' advances in other areas, *e.g.* on acquisition of English language skills, by Stevens (1994), Espenshade and Fu (1997), and Hakimzadeh and Cohn (2007), on use of English in the home, by Alba and Nee (2003), on acquisition and use of English and linguistic isolation, by Portes and Rumbaut (1996), on voting, by Ramakrishnan and Espenshade (2001), on political party identification, by Wong (2000), on homeownership, by Alba and Logan (1992) and Myers and Lee (1998), and on occupational status, by Toussaint-Comeau (2006). All of these domains deserve to be addressed in an overall assessment of immigrant advancement.

Most studies of immigrant advance treat a single or a closely related set of outcome variables in a single domain (*e.g.*, English language skills, use of English, and linguistic isolation by Portes and Rumbaut, 1996). However, some studies treat multiple outcomes, either as being causally related or as different dimensions of an underlying process. In the field of health research, for instance, immigrants' use of English language is employed as a primary indicator of what health researchers characterize as acculturation (Marin et al. 1987; Mainous et al. 2008). In economics, level of education is used as a measure of skills and human capital, as is English proficiency, and both are often analyzed in conjunction with earnings (Chiswick 1991, Sorensen and Enchautegui 1994, and Park 1999). Nonetheless, in almost every case these other indicators are treated as

occurred for some cohorts of Asian immigrants in their level of education, income, and homeownership, in which case higher attainment perversely implies a reduction in assimilation.

³ While the process of assimilation is measured by the rate of convergence of the foreign-born population, current assimilation status is measured by differences in level of attainment between foreign and native-born populations. This in turn is determined by the process or rates of assimilation.

explanatory variables for the process of immigrant advancement rather than as manifestations of a related, parallel process.

One recent exception is a composite index of immigrant assimilation proposed by the Manhattan Institute (Vigdor 2008). That analysis combines the effects of at least nine distinct, observable outcome variables. Assimilation is measured by the degree of status similarity between immigrant and native-born residents: the less they can be distinguished, the more they are assimilated. With this method, comparisons are made between groups and between decades, and earlier waves of immigrants are tracked across decades to see how much they converge with the native-born. Although appealing in some respects, the method is not fully transparent and leads to anomalies. Initial attainments and subsequent rates of advance are not distinguished. Nor are immigrant advances distinguished from changes in the native-born population: convergence could occur or not due to changes in either population. For example, higher education levels of the native-born children of Mexican immigrants would perversely make the Mexican-origin population appear less assimilated (greater difference between native and foreign born) than if the children had retained low levels of education. This illustrates how an emphasis on gaps between immigrants and the native-born is a less reliable indicator than increases in absolute attainments.

Alba and Nee (2003), by contrast, consider multiple outcome variables without hypothesizing a complete or precise relationship among them. Instead, they identify areas of distinct outcomes (“forms of assimilation”) and explicitly consider the relationships among outcomes across immigrants from different origins. Alba and Nee distinguish among multiple indicators of

acculturation, socioeconomic attainment, social relations, and spatial integration. Although Alba and Nee do not address the advances of immigrants (their main emphasis is on assimilation between immigrant generations), their grouping of variables into clusters of interrelated outcomes offers a useful approach for summarizing immigrant advances. In another study with multiple indicators, Park and Myers (forthcoming) employ a suite of six indicators to measure intergenerational mobility by the mean changes in status between immigrant parents and the children's generation when they reach the same approximate age 25 years later.

We employ a similar framework and select multiple indicators of immigrant advancement in different domains. As a demonstration of the proposed measure we will estimate summary measures of first-generation immigrant advances by comparing attainments at three points in time spanning two decades. By taking separate account of initial attainments and subsequent advances, we will compare advances among outcomes, between decades, and across origin groups.

III. Measuring Immigrant Advances Over Time

The advancement of first-generation immigrants is a process in time and its measurement requires careful attention to temporal relationships. This has been especially troublesome for past studies of advances in different domains because these temporal relationships have been specified in ways that create biases. Moreover, differences between the specifications adopted in different domains prevent meaningful comparisons among them.

1. Different Temporal Specifications for Different Outcomes

The rates of improvement in English language skills, for example, are very different for those who arrive as children, during the “critical age” for language learning, and those who arrive as adults. To measure these differences, studies of the acquisition of language skills include as explanatory variables both age at arrival and years since arrival (e.g., Stevens, 1994, Espenshade and Fu, 1997, and Hakimzadeh and Cohn, 2007). Myers et.al. (2008) find that the effects of young age at arrival are much greater for language acquisition than other outcomes. Thus, studies of advances in other domains more often include age, rather than age at arrival, as an explanatory variable to measure experience or life stage, e.g., Ramakrishnan and Espenshade, 2001 and Wong, 2000 for political participation, Sorensen and Enchautegui, 1994, for earnings, and Toussaint-Comeau, 2006, for occupational status.

Other studies control for the effects of age by restricting the analysis to only the adult population, e.g. Hakimzadeh and Cohn (English skills), Espenshade and Fu (1997, English skills), Clark (1996, homeownership), and Toussaint-Comeau (2006, occupational status). While this device eliminates one temporal bias it potentially introduces another, as length of U.S. residence is highly correlated with age at arrival among a population with a truncated age distribution.

Biases due to correlation between time since immigration and age at arrival can be effectively eliminated if the population is further narrowed to a particular age who arrived during a particular decade, e.g., Borjas and Friedberg (2006) consider only those age 25-34 who entered the U.S. in a specific decade. By focusing on a limited segment of the demographic spectrum, this method obtains a temporally unbiased measure of advances in a decade (or other time span). However, it does this at the expense of generality, ignoring the advances made by the majority of

immigrants who arrive at other ages. It is temporally unbiased but at best an *indicator* of the advances made by immigrants who arrived at other ages. (Of the entire foreign-born population in 2000, 31% entered the U.S. between ages 25 to 34, 44% at younger ages, and 25% at older ages. U.S. Bureau of the Census 2003a.) Even if the benchmark group is the modal age at arrival, it may not be representative of the average or modal advance.

2. Interdependence of Temporal Changes

For every immigrant there are two important clocks. One starts at birth and tracks an immigrant's age and, by inference, stage of *life*. The other starts on the day of entry to the U.S. as an immigrant and tracks time spent in the U.S. and stage of settlement.⁴ The two time scales interact because time in the U.S. has different impacts depending on *age at immigration*, or arrival. Thus an immigrant's attainment at any time after entry to the U.S. is potentially affected by his or her age, time in the U.S., and age at arrival. Meaningful comparisons of advances across groups of immigrants from different origins or in different decades require a uniform, standard treatment of *all three* temporal variables. Without a standardized measure, variations in the specification or measurement of the three temporal variables almost invariably introduce biases and complicate comparisons.

This interdependence of multiple temporal dimensions confounds the measurement of immigrant advancement in multiple ways. As time passes, immigrants grow older, their length of time in the U.S. increases, and new cohorts of arrivals enter the U.S. Also, the passage of historical time brings a changing economic and political context that shapes immigrant incorporation and can

⁴ Although the date of entry to the U.S. may be uncertain for circular migrants, this ambiguity is mostly confined to the most recent arrival cohort. After 5 years if not sooner, most migrants consistently identify the time when they arrived in the U.S. to stay.

help or impede immigrant advancement. Thus a snapshot comparison of immigrant status attainment at one point of time embeds many factors, and comparisons between two points in time include both the historical changes and the simultaneous changes in aging and growing duration. Failure to account for all these temporal variables creates a bias of *omitted temporal dimensions* because the effects of the unaccounted temporal dimension become embedded in the others.

3. Temporal Biases

Bias of omitted temporal dimensions has several different forms. An unaccounted *age compositional shift* creates bias when the status attainment of an older population in one time period is compared to the population that was younger in an earlier time period. So obvious is this factor that researchers are almost always careful to control age when comparing groups or time periods, and in fact adjustment for age differences is surely the most common temporal control employed throughout the social sciences.

A similar bias is created by an unaccounted *immigrant durational shift*. Whenever the flow of immigrant arrivals proceeds unevenly across decades, the resulting duration composition of the foreign born residents will be skewed. For example, the acceleration of immigration from 1970 to 2000 has greatly increased the numbers of more recent arrivals relative to the longer-resident previous arrivals.⁵ Deceleration of immigration after 2000 and the concurrent lengthening residence of earlier arrivals will again shift the duration composition of the foreign born to a longer-settled profile on average. The practical effect of duration differences is that recent

⁵ In 1970, 47% of the foreign-born population had entered the U.S. more than 30 years previously, in 1990, 17%, and in 2000, 15%. U.S. Bureau of the Census 1971, 1993a, 2003a)

arrivals have not had time to advance, while immigrants of longer residence have, and so an increase in the number of recent arrivals will lower average attainment levels for the foreign-born population.⁶ Thus any comparisons of immigrant advancement must also control for the duration composition of the groups being compared.

Less widely recognized is the bias stemming from *false attribution of current status attainment solely to advancement*. In fact, the initial attainment after arrival, which is heavily affected by immigrants' endowments, is an important component of the status attainment later observed. Group A of immigrants may arrive with high status and achieve little subsequent advances. Group B may arrive with low status and thereafter make substantial gains. It would be erroneous to ascribe smaller advances to Group B or to use its lower overall level of attainment as evidence that the group is not improving its status in America.⁷ Initial levels of attainment and subsequent advancement should be separately identified and measured but not conflated or confused.

The final form of temporal bias to be discussed is the *cross-sectional cohort fallacy* that strings together age-specific or duration-specific attainments observed at a single point in time as if the cross-sectional sequence represented the longitudinal path of attainment. Although the error of using age cross-sections in this manner is commonly noted by demographers, the equivalent problem is not as widely recognized for comparisons of duration groups. Scholars may resort to

⁶ The effect of duration on immigrant status attainment is reviewed in Myers (2007: chapter 6) and demonstrated in the case of six different outcome measures. The effects on average advancement of the immigrant population are noted and discussed in Vigdor (2008).

⁷ An illustration of this biased interpretation is the comparison of homeownership attainment by Asians and Latinos. The former attain high levels of homeownership shortly after arrival, with much less progress thereafter, while the latter exhibit substantial upward mobility that is sustained over three successive decades of lengthening residence (Myers and Lee 1998).

this technique when only a single cross-section is available.⁸ The classic illustration in immigration is Chiswick's (1978) analysis of earnings by successively longer settled residents, based solely on the 1970 census data,⁹ which was later challenged by Borjas (1985) once a second cross-section supplied by the 1980 census became available.

IV. A model for constructing a summary measure of immigrant advancement

It would clearly be useful to have a temporally unbiased measure that summarizes the advances of different arrival and birth cohorts. Myers and Lee's (1998) comparisons of residential assimilation among origin groups are comprehensive, as they include a range of ages and durations since entry and show consistent relationships among numerous coefficients and plots. However, the array of results creates an information overload that defies easy comprehension or summarization. A more succinct summary measure would at once quantify the aggregate impact of variations in advances within specific domains and facilitate comparison of advances in different domains. One approach would be to select a single "representative" birth-arrival cohort and ignore others (as in Borjas and Friedberg). Another is to present an array of estimated advances made by all cohorts (as in Myers and Lee). The measure proposed here takes a third approach that aggregates and temporally standardizes the estimates for individual cohorts at different stages of life and stages in the "immigrant settlement process."

The summary measure we propose and estimate is the *hypothetical cumulative lifetime advance* of a new immigrant who advanced at each stage at the same rates as immigrants at all stages in

⁸ Several studies of immigrant cohort advancement have tapped the available sources of true panel data (e.g., Duleep and Regets 1997, for wages and Toussaint-Comeau 2006, for occupational status). However, limitations of population coverage, sample size, and historical depth in available panel surveys limit their wider use. The New Immigrant Survey is a particularly important new source that will enhance longitudinal understanding in the future.

⁹ See Hakimzadeh and Cohn (2007) for a more recent example.

the current period. What we term the Expected Lifetime Advancement (ELA) index will be recognized as similar in construction to the total fertility rate (TFR), which combines the age-specific birth rates of women of different ages during a particular period. This widely used measure provides a period snapshot that sums discrete segments of current life experience as if it were experienced over an average person's lifetime. Our proposed measure of the pace of immigrant advancement is analogous in that it is a composite picture of the average experience of the entire population of immigrants from a particular origin during a specific span of time. The ELA index synthesizes and summarizes the advances of cohorts at different stages of their lives and careers in terms of the lifecycle experience of a hypothetical "representative" immigrant.

In this and the following sections we define this measure and describe the results of applying it to the advances of immigrants in two decades for seven distinct areas of attainment.

Comparisons are drawn between these estimated ELA measures for different groups and periods.

1. Measuring discrete segments of change

The proposed method of summarizing immigrant advances builds on discrete segments of change, combining these in a sequence that represents the hypothetical lifetime if lived at the pace recorded in the observed time period. These segments that are the building blocks for the ELA index are explained in this section.

The *expected lifetime advancement* index summarizes the advances made by different birth-arrival cohorts between two successive censuses or surveys toward a particular threshold of attainment, e.g., language proficiency, homeownership, etc. For each census there is an

observation of the share of each birth-arrival cohort who have attained the threshold, such as proficiency in spoken English.¹⁰ Cohorts are defined by a common year of birth, b , and year of arrival, or entry, e . As of any census year, the cohort's age, aN , and time since migration, or duration, dN , are determined as $aN = yN - b$ and $dN = yN - e$, and the *attainment* of the cohort as of yN is $x_{aN,dN}^{yN}$.¹¹

The discrete segments of change are defined as follows. If the interval between censuses or surveys, $y2 - y1$, is Δ (10 years in the U.S.), then for any birth-arrival cohort

$$1) \quad a2 - a1 = d2 - d1 = \Delta .$$

A cohort's *advance* between census years $y1$ and $y2$ is calculated as the difference in the cohort's attainment between the censuses,

$$2) \quad p_{a1+\Delta,d1+\Delta}^{y2} = x_{a1+\Delta,d1+\Delta}^{y2} - x_{a1,d1}^{y1}$$

This is defined for all birth-arrival cohorts in $y2$ for which, in $y1$, $d2 > 0$ and $a2 > 0$. In addition, new immigrants are initially observed in the first census after their arrival, and some amount of post-arrival advance may accrue before measurement. Nonetheless, we treat these attainments as initial.

2. Constructing the synthetic lifetime sequence of change

By combining the observed advances for different cohorts together we obtain a *synthetic*

estimate of the expected advance $l_{ai \rightarrow A}^{y2}$ to any age $A > (ai + \Delta)$. This measure describes a

¹⁰ More generally, advances can be measured by the mean value of a continuous variable such as wages. The cohort share measure can be thought of as a special case in which the outcome is measured by a 0/1 dichotomous variable, e.g., equal to 1 if a person has attained the threshold level of the variable, otherwise equal to 0.

¹¹ By assumption the population described is from a specific origin, so no index of origin is necessary.

hypothetical cohort making the advances actually observed for cohorts at each age and the corresponding duration, from $(di+\Delta)$ to $(A-ai)$ during the period $y1-y2$. We first transform the absolute change in attainment (proportional per capita) into a hazard function, which expresses any advance as relative to the population “at risk” of advancing, i.e., those who have not already attained the status,¹²

$$3) \quad p_{a1+\Delta, d1+\Delta}^{y2} = r_{a1+\Delta, d1+\Delta}^{y2} / (1 - x_{a1, d1}^{y1})$$

The total advance is then calculated as the cumulative “hazard” of advancing,

$$4) \quad \begin{aligned} l_{ai \rightarrow A}^{y2} &= 1 - (1 - x_{a1,0}^{y1}) * (1 - p_{ai+\Delta, \Delta}^{y2}) * (1 - p_{ai+2\Delta, 2\Delta}^{y2}) * \dots * (1 - p_{A, A-ai}^{y2}) \\ &= 1 - (1 - x_{a1,0}^{y1}) * \prod_{k=1 \text{ to } (A-ai)/\Delta} (1 - p_{ai+k\Delta, k\Delta}^{y2}) \end{aligned}$$

It would be possible to calculate the lifecycle advance after arrival at age ai by picking a sufficiently advanced target age A . However, the small numbers of immigrants of advanced age, even in large census (PUMS) samples and the very approximate coding of pre-1950 years of arrival in U. S. censuses before 2000 constrain us to topcode the life cycle at age 75 and the settlement process at 30 years after entry.¹³

Some measures of lifetime advance reach their peak at the maximum age because they are either in principle or in practice irreversible, e.g., citizenship, academic degrees, and language ability. These can only decline as the result of selective migration, mortality, or, in the case of language ability, dementia. Other outcome variables decline substantially on average after a lifecycle peak age, e.g., earnings and occupational status. Homeownership is an intermediate case; declines

¹² We also estimated ELAs using a linear probability functional form. There problems with boundedness, notably for the Citizenship variable, and the other ELAs were much less stable between decades. The hazard function seems preferable on both theoretical and empirical grounds.

¹³ In practice, the difference between a terminal age of 75 years and a more usual lifetime maximum age of 99 or 100 years is likely to be negligible, due to the low average advances observed at advanced ages and durations.

after a lifecycle peak are possible through “trading down,” but in practice are found to be exceptional. A measure of expected lifetime *peak* advance would treat these variable patterns on a uniform basis therefore seems a more meaningful measure than that attainment at a specified advanced age, which is potentially lower and incorporates declines as well as advances. The lifetime advance in the period $y1$ - $y2$ after arrival at age ai is therefore defined as

$$5) \quad L_{ai}^{y2} = \max(l_{ai \rightarrow ai+\Delta}^{y2}, l_{ai \rightarrow ai+2\Delta}^{y2}, \dots, l_{ai \rightarrow 75}^{y2})$$

These expected advances, one for each age of arrival, are combined into a single summary expected advance by means of an average weighted by the numbers of immigrants that arrive at each age. To avoid biases due to differences in age composition between different immigrant groups, a single base age distribution of immigrant arrivals in one census is used for all periods for a given origin group.

This *age-and duration-standardized* mean lifetime advance in the period $y1$ - $y2$, \underline{L}^{y2} , is calculated using as weights the number of immigrants that entered at each age ai in reference year yR , n_{ai}^{yR} ,

$$6) \quad \underline{L}^{y2} = \sum_{ai=0 \text{ to } 74} L_{ai}^{y2} * n_{ai}^{yR} \div \sum_{ai=0 \text{ to } 74} n_{ai}^{yR}$$

Because it combines immigrants of all ages at arrival, both those in Generation 1.5 and the critical age for language learning and those who come as adults, this measure is in practice too broad for some outcomes. We therefore also consider the mean lifecycle expected advance for immigrants in two broad age groups separately, the mean lifecycle expected advance for Generation 1.5 immigrants,

$$7) \quad \underline{L}_{<15}^{y2} = \sum_{ai=0 \text{ to } 14} L_{ai}^{y2} * n_{ai}^{yR} \div \sum_{ai=0 \text{ to } 14} n_{ai}^{yR} \setminus$$

and the mean lifecycle expected advance for adult immigrants,

$$7') \quad \underline{L}_{>=15}^{y2} = \sum_{ai=15 \text{ to } 74} L_{ai}^{y2} * n_{ai}^{yR} \div \sum_{ai=15 \text{ to } 74} n_{ai}^{yR} \quad .^{14}$$

(It will be noted that insofar as the mean expected lifetime peak advance is an average of expected advances for different ages of arrival and that some of the measured outcomes are reversible, the mean expected lifetime advance is not directly analogous to a total fertility rate.)

Examples of the base data and calculation of mean expected lifetime advances are described in the Appendix. Before applying the Expected Lifetime Advancement (ELA) index in the following sections, we note that, it differs from the total fertility rate measure in that it is bounded above by 1.0. In this respect it is similar to the probability of first marriage. However it is unlike the probability of marriage in that the base, floor level of attainment is greater than zero for some outcomes, e.g. ability to speak English, level of education, and earnings.

3. Initial Attainment and Subsequent Advancement: Endowments and Period Effects

If, as this method proposes, initial levels of attainment and subsequent advances can be measured net of temporal biases, we expect to observe underlying differences between decades and among immigrants from different origins in both their initial levels of attainment and subsequent advances. Such variations in attainment should be understood to result from the joint effects of differences in *endowments* among cohorts of immigrants and differences in *period effects* caused by varying economic, social, and political conditions in the U.S.¹⁵

¹⁴ Mean expected lifetime advances for different ages at arrival vary widely from the overall mean. There are particularly large differences between cohorts arriving before and after age 15, the critical age for language learning. See below.

¹⁵ A third class of effects is locational, due to variations in the economic, social, or political context of immigrants. Stevens (1992) finds that immigrants in larger and more residentially segregated language groups are less likely than

Variations in endowments have been linked to differences in country of birth (Arviza and Garcia 1996, and Schoeni 1998), whether English is recognized as an official language in the country of origin (Espenshade and Fu 1997), and level of education before immigration (Duleep and Regets 1997, Akresh 2006). Economic and labor market conditions are likely to affect the earnings of immigrants at all stages of settlement; so too housing market conditions and mortgage availability affect the ability of immigrants to purchase homes, and changes in the political climate are apt to affect voting and naturalization by immigrants at all stages of settlement.

It is tempting to assume that variations in the initial attainments of immigrants are entirely attributable to differences in endowments, on the one hand, and that variations in their subsequent advancement are due entirely to period conditions, on the other hand. However, in actuality, the effects of immigrants' endowments are enmeshed with those of current context of economic, social, and political conditions at all stages of settlement. Consider a cohort of new immigrants who arrive during a five-year interval and are observed at the end of the period. Their attainments include an average of 2 ½ years of post-entry gains (assuming a constant flow of arrival during the period). Since rates of advance in many domains are observed to be greatest in the period immediately following arrival, the gains in the early years are not trivial.¹⁶ Thus variations in initial observed status attainments cannot be attributed entirely either to differences in endowments or post-entry advancement. Conversely, endowments may continue to have effects on rates of advance long after entry and may play a role in differences between the

others to use English. Duleep and Regets (1997) find that immigrants are relatively concentrated in states with more rapid growth in immigrant earnings.

¹⁶ Were it possible to observe immigrants' status on their exact day of arrival, current contextual effects would be much reduced. However, this is only a theoretical possibility.

advances of immigrants from different origins in the same period. Duleep and Regets (1997, 2002) notably find effects of immigrants' level of education on both initial earnings and subsequent growth in earnings.¹⁷ With the foregoing cautions, however, we can reasonably assume that some variations in initial attainments result are largely attributable to differences in endowments, *e.g.*, between origin groups in the same period, and some variations in rates of advancement result largely from differences in the context of current conditions, *e.g.*, between periods for a particular origin group.

¹⁷ Duleep and Regets also find an inverse relationship between wages after entry and subsequent rates of advance.

V. Outcome variables and data sources

1. Outcomes

We calculate expected lifetime advances in two periods, from 1980 to 1990 and from 1990 to 2000, from the shares of the census population that have reached specified thresholds for the following outcome characteristics.

Fluency in spoken English, i.e., speaking English only or speak it “very well”).

High school completion or GED equivalent.

College level education (represented by 16 years or more of education or a 4-year college degree such as the B.A.)

Higher occupational status is attained if a person is employed in a professional or managerial occupation, specifically selected because it requires a high level of education and/or training or that involves responsibility for personnel or equipment.¹⁸

Earnings above the poverty level is attained if a person’s individual earnings for the previous calendar year exceed the federal poverty standard for a family of four with two children.

This summarizes in a single variable the combined effects of rates of labor force participation, wage rates, and hours worked.

Homeownership is attained if a person is either a householder or spouse of householder *and* lives in a household that owns its housing unit. It is a per capita measure, not directly comparable with a homeownership rate for households, and weighs the two genders

¹⁸ Including managers, professionals, supervisors in any field, sales proprietors, farm operators and managers, mechanics, repairers, electricians, plumbers, pipefitters, steamfitters, and operators of plants come as systems, and material moving equipment. (Census 2000, Item 28) Code definitions are the same in 1980 and 1990 censuses and differ in the 2000 census, and are available from the authors upon request. A category in the 2000 census is coded as high status if more than half of the population in it are in categories classified as high status in the 1990 census according to a correspondence table (crosswalk) between 2000 census and 1990 census codes (U.S. Census Bureau 2003). Our review of the crosswalk table finds that less than 4% of all workers are assigned to the wrong category according to this criterion and that the numbers of erroneously included and excluded workers are approximately equal.

equally. This per capita definition summarizes household formation and tenure choice in a single variable.

U.S. Citizenship is attained through naturalization and is calculated only for individuals who are foreign-born of noncitizen parents.

Advances are calculated as absolute ten-year decadal increases in the percent of the population that attained the above thresholds.

These variables are grouped in broad domains of immigrant integration: English proficiency and education represent *Acculturation and Acquisition of human capital*; earnings, occupation, and homeownership represent *Socioeconomic status*; and citizenship represents *Civic incorporation*. Certainly additional indicators of immigrant status attainment could also be analyzed and we do not mean to imply this listing is complete.

These outcomes are calculated for immigrants in two large origin groups, those born in Mexico and those of Asian or Pacific Island race.¹⁹ These groups comprised 29.5% and 23.2 % of the foreign-born population in 2000 respectively. The Asian origin population is more heterogeneous than the Mexican born, and it would be possible to calculate expected lifetime attainments for immigrants from specific Asian nations. However, our purpose here is to compare the advances of large segments of the immigrant population with known differences in status attainments.

2. Data

Advancement in each of the outcome areas is measured by the inter-census changes in average attainments of birth/arrival/origin cohorts in the 5% Public Use Microdata Samples (PUMS) of

¹⁹ This includes all persons of any Asian or Pacific Island race. The number of immigrants of more than one race is negligible.

the long form (sample) questions in the censuses of 1980, 1990, and 2000. It must be noted that these are not true panel data but *quasi-panel* data, in that individuals are not followed over time but instead are compared over time by use of independent random samples of individuals drawn from the same birth/arrival/origin cohorts. The change in the mean attainment of a cohort of immigrants is equal to the mean change in the cohort's attainment aside from the effects of sampling variations or any selective changes in the cohort's population.

Cohort membership is determined by responses to four census items, age, citizenship, year of entry, and country of birth. Of these, only year of entry seems potentially problematic. In the 1980 and 1990 censuses, this item is from responses to a question asked of persons born in a foreign country, "When did [he] come to the United States to stay?" with responses in interval categories (e.g., 1975 to 1980, or before 1950). In Census 2000 the question was revised, asking for an exact year of entry, "When did this person come to live in the United States?" Despite the slight changes in wording and response format, there is no evidence of inconsistencies in responses to this item between 1990 and 2000. A sample survey in which respondents to the 2000 census were reinterviewed (Singer and Ennis 2003) found a "low" degree of inconsistency for questions related to place of birth, citizenship and year of entry as well as age. Out of 58 items tested, 16 were in the favorable "low" category. This relative stability of responses suggests that the questions provide reliable measures of the intended concepts.

Even if the classification variables are measured consistently in different censuses, substantial changes in cohort populations due to emigration or mortality could potentially bias estimates of mean advancement. It is speculated by Stevens (1994), Borjas (1995), and others, that emigration is sufficiently selective to bias estimates of changes in attainment. Lubotsky (2007) finds

indications of such an effect in retrospectively matched data on earnings. However his inference of highly selective emigration rates and upward bias in quasi-panel estimates of earnings growth is weakened by very low match rates and limited controls for immigrants' origin. Myers (2004) reviews data on four recent arrival cohorts' levels of educational attainment between three recent censuses. He finds that they are nearly stable with the exception of plausible increases in college completion for cohorts in their 20s. While quasipanel data on immigrant advancement potentially include biases in either direction due to selective inter-census migration, there is little evidence of strong impacts between 1980 and 2000.²⁰

Descriptive statistics on the shares of the adult population, age 15-74, that currently reach the seven threshold levels of attainment are shown in Figure 1 for the Mexican-born population. The levels of attainment, standardized by age and time since entry to the U.S., range from 2.5 % for B.A. education in 1980 34.6 % for English fluency in 1990.²¹

VI. Results: Expected Lifetime Advances

1. Initial and Expected Lifetime Attainments

We now turn to the results of our method of summarizing immigrant advancement. Mean initial and expected lifetime attainments for the Mexican-born population are shown in Figure 2 for 1980-1990 as empty and solid blue (lightly shaded) circles and 1990-2000 as empty and solid brown (darker) circles. Initial attainments in High school education and Earnings are somewhat higher in the later decade but in other areas they are similar in the two decades. By contrast, the lifetime attainments in four domains, High school education, Earnings, Homeownership, and

²⁰ Myers (2004) cautions that immigrants with less than 5 years duration in the U.S. are most vulnerable to selective emigration bias because of their high rates of mobility.

²¹ The effect of standardization to the 1990 age-duration distribution is to raise most 2000 attainments above unstandardized levels for both origin groups, while the effects on the attainments in 1980 are mixed.

Citizenship, are substantially higher for the later than the earlier decade, and slightly higher in two others, B.A. education and Occupation. However, the expected lifetime attainment for English fluency is substantially lower in 1990-2000 than 1980-1990.

2. Expected Advances

The expected lifetime advances are indicated by lines connecting initial and expected lifetime attainments in Figure 2 and are shown separately in Figure 3. Expected lifetime advances in 1990-2000 were greater than in the previous decade for all outcomes except English fluency, and by a substantial margin for three outcomes. The ELA measure yields a clear answer to the question posed at the beginning of the paper about how Mexican immigrants are faring. Across the board, with the sole exception of English language acquisition, they fared substantially better during the 1990s than over the previous decade.

It is instructive to compare the experience of Mexican immigrants with Asians (Figure 4). For Asians, rates of advance were more nearly equal in the two decades and may even have slightly slowed for homeownership.²² The only outcome for Asians for which later advances were greater is Citizenship. As for the Mexican-born population, expected lifetime increases in English fluency were slower in 1990-2000 than 1980-1990.

It bears remembrance that these advances are net of the initial attainments observed after entry. It is those initial attainments that have given Asians a large apparent advantage over Mexicans. It also should be noted that the descriptive age- and duration-standardized current attainments

²² Higher initial attainments in the 1990s may be due to shifts in the national origin of Asian immigrants, a source of variability not present among Mexican-born immigrants.

shown in Figures 1 reveal some similar patterns for the Mexican-born -- improvements over time in education and occupational status, as well as slower English language acquisition after 1990 than before – but reveal scant evidence of post-1990 acceleration of advances in Earnings, Homeownership and Citizenship.²³

3. Comparisons and Discussion

The lifecycle advances estimated in this paper improve on the simple standardization by age and duration that was shown in Figure 1. Although that was successful in correcting for some temporal biases, other factors are unaddressed, including the distinction between initial attainments and subsequent advances. In addition, by its design, the simple standardization precludes observation of the extent of advance that is expected over a lifetime. Nor can the simple standardization detect differences between relatively fixed characteristics such as educational attainment and more fluid achievements such as homeownership. In addition, the simple standardization is not able to detect changes in the pace of advance between decades. Further, the simple standardization, being a static method, understates the current pace of advance by immigrants. For these purposes, the proposed method affords a much more sensitive summary measure.

The acceleration of advances by Mexican-born immigrants during the 1990s, though similar to the trend for native-born Hispanics, begs explanation to verify the credibility of the analytic method. We think this outcome is not implausible and suggest the following potential causes: (1)

²³ The expected lifetime attainments are, of course, generally higher than current attainments because they reflect lifetime peak attainments, not the average of immigrants in all stages of settlement from entry to old age. The declines in current attainment of Citizenship for both Mexicans and Asians between 1990 and 2000 are, for example, attributable to increases in the share in the population of recent arrivals with low rates of naturalization.

Legalization through the provisions of the 1986 Immigration Reform and Control Act (IRCA) removed barriers to employment, financing, education, and mobility for 2.00 million immigrants from Mexico but only .13 million born in Asian countries. (2) *Geographic dispersion* of immigrants from Mexico outside established gateway states and metropolitan areas between 1990 and 2000 gave them greater access to higher paying and higher status jobs (Singer et al, 2008). (3) General labor market conditions between 1990 and 2000 raised incomes at the lower end of the income distribution, including those of Mexican immigrants. Median constant dollar earnings of full-time male workers rose 5.3% after falling by 4.0% between 1980 and 1990.

The finding of a marked decline in English language acquisition at later stages of settlement after 1990 for both Mexican and Asian immigrants has not been previously reported and seems anomalous. This trend is at odds with the acceleration in social and economic advances for Mexicans and is incongruent with the stability of advancement in other areas for Asians. However, the finding is robust: It is seen not only in the expected lifetime advance measure but also the standardized current attainments (Figure 1). Only the former measure, however, makes clear the extent of the slowdown and the fact that it is caused by slower advances *following initial attainments* observed after entry. Further investigation is needed to determine whether this slowdown is due to possible differences in respondents' interpretation of response categories in data collection instruments or whether it represents a true change in behavior, and also whether this has continued since 2000.

VII. Conclusions

The measure proposed in this paper provides a period-specific summary of the pace of immigrant advancement. Our proposed Expected Lifetime Advancement (ELA) index bears similarities to the Total Fertility Rate (TFR). Whereas the latter is adjusted for age differences in fertility, compiling a current age schedule to represent hypothetical lifetime fertility, the ELA is adjusted for current age, age-at-arrival, and length of residence in the U.S. These adjustments avoid the several temporal biases that are apt to distort assessments of the rate of immigrant advancement.

A second important feature of the ELA is its identification of two distinct components of advancement, one representing the initial attainment status observed shortly after immigrant arrival, and the other representing the cumulative advancement after arrival. This distinction is crucial for assessing the rate at which immigrants adjust while living in the U.S.

The application in the present paper demonstrates how the ELA is calculated and how it can be used to describe the advances of immigrants on a wide variety of indicators. Our emphasis has been that no single indicator, such as earnings or English, is sufficient to describe immigrant experience or achievement. In compiling a variety of indicators we also have resisted the temptation to combine them into a weighted average composite measure. It is more accurate to describe immigrant experience as rapid advancement in some outcomes, like homeownership, and slower changes on others, like education.

The findings on immigrant advancement reported here spotlight two groups in two decades. Among both Mexican and Asian immigrants, much greater advances were recorded in the areas

of socioeconomic status and civic integration than for human capital acquisition and acculturation. Nonetheless, substantial gains were experienced in the 1990s on all outcome measures, at a similar pace for Mexicans and Asians. In comparison to the preceding decade this was an improvement for Mexicans, for whom there was a marked decade-to-decade acceleration of the pace of immigrant advancement on 6 out of 7 indicators. In contrast, among Asians, the pace of advance was more nearly equal in the two decades, increasing appreciably in only one outcome (citizenship).

Overall, this paper has furthered understanding of the immigrant settlement process in several respects. For the first time a temporally unbiased summary measure of immigrant advancement has been proposed. It adjusts for the effects of growing numbers of newcomers, which have tended to lower the observed average status attainment of immigrants in recent decades. It also distinguishes between initial status attainment and the subsequent advances, about which there is such great public interest. Of particular substantive importance, the new methodology developed in this paper allows a more accurate appreciation of the pace of immigrant advances in the U.S., disproving the superficial inference that low average attainment represents a low degree of advancement.

Appendix: Mean Lifetime Expected Advancement, Sample Data and Calculation

Examples of the base data and calculation of Expected Lifetime Advancement (ELA) are shown in this appendix for one origin group, Mexican-born immigrants, and one attainment, fluency in English, between the censuses of 1980 and 1990.²⁴ Input data and calculations of combined advances for cohorts at different ages at arrival are shown in Tables A-1 and A-2. These advances are compiled in Table A-3 and in turn combined into ELAs in Table A-4.

Table A-1 shows the 10-year advances for all those cohorts who arrived in the U.S. in years ending in digits 5 through 9, the “second half-decade” cohorts arrayed by their age at arrival (rows) and age in 1980 and 1990 (columns).²⁵ The fifth row, for example, shows the advances made by cohorts who arrived at the modal age of arrival, 20-24. The first entry in the row (.130) shows the 1980-1990 net increase in the share fluent in English for the cohort that was age 20-24 in 1980 and entered the U.S. between 1975 and 1979. The next entry (.088) shows the increase in share for the cohort that was age 30-34 in 1980 and entered the US between 1965 and 1969. These increases are calculated as shares of the cohort who had *not* attained fluency in English at the start of the decade, *i.e.*, as a hazard function transformation.

Note that the *final* age of the cohort in each cell as of 1990 is the same as the *initial* age as of 1980 for the *second* cohort to the right. The lifetime maximum advance of a cohort from arrival at age 20-24 to age 70-74 can therefore be obtained as the cumulative increase in the “hazard” of

²⁴ Defined as speaking only English at home *or* speaking another language at home and speaking English “very well.”

²⁵ The assignment of ages at arrival is approximate, due to the use of interval codes for year of entry in censuses before 2000. For cohorts who arrived in years ending in digits 5-9, age at arrival is set equal to their age in the following census; for those cohorts who arrived in years ending in digits 0-4, we use their age in the next census minus five. We denote these cohorts as “- 0” and “- 5”, respectively.

speaking English fluently implied by the increases in this row, or .332, each cell representing the proportional decline in fluency in a different 10-year age and duration of residence span. An additional calculation is required for those cohorts which arrived at ages ending in digits 5 through 9, such as at ages 15-19 (4th row of the table), because the oldest final 10-year age for each chain is 65 to 69 years and therefore short of the final age for the other cohorts. To equalize the spans of experience for the two sets of cohorts, an estimated 5-year advance from age 65-69 to 70-74 (equal to one half the 10-year advance to age 70-74 of the oldest cohort that arrived at the same age, shown in Table A-2) is included in the lifetime maximum advances for cohort chains that otherwise end at age 65-69.

Since the census does not ask about the language ability of children younger than five, the level of English fluency for the cohort in the first cell in Table A-1, at age 0 to 4, is set to zero.²⁶

The comparable advances made by cohorts who arrived in years ending in digits 0-4, the “first half-decade,” are shown in Table A-2.²⁷ Since the first cohort in each row is first observed more than 5 years after arrival in the U.S., the cohort “chains” in this table are missing the first 5 years of advance that are included for the “second half-decade” arrival cohorts in Table A-1. (The initial age for the first cell in each row in Table A-1 is equal to the age at arrival; here it is five years older.) Therefore in order to obtain advances from arrival to age 70-74 on a consistent

²⁶ This assumption is necessary if the advances of those immigrants who arrived before age 5 are to be included in the analysis and overall summary measure of immigrant advances. Alternatively cohorts who arrived before age 5 can be dropped from the analysis.

²⁷ Comparison of Tables 2 and 3 will reveal that advances for some second half-decade arrival cohorts are identical to first half-decade arrival cohorts at the next lower age at arrival. These equalities are due to the coding of all years of arrival prior to 1960 in just two categories, 1950 to 1959 and before 1950 (shaded cells in Table 2 and 3) in censuses before 2000.

basis with the cohorts in Table A-1, five-year advances from arrival are estimated²⁸ (in the third to last column in Table A-2) and included in the total lifetime advance from arrival.

The lifetime advances to age 70-74 are shown in the last column of Table A-2. The separate estimates for two chains of cohorts that arrived at each age (in Tables A-1 and A-2) are combined into a single mean estimate lifetime advance to age 70-74 and shown in Table A-3.

The populations of the cohorts that arrived in 1985-1989 (Table A-3, column 4) are then used as the basis for weighted, age-duration standardized means combining the total advances for different ages at arrival (Table A-4). The mean total expected advance for all ages of arrival is .353. In other words, if all immigrants from Mexico increased their fluency in English during their lives at the same rate as the cohorts of Mexican-born immigrants who were at the same age and duration of residence in the U.S. did during the decade of the 1980s, then the fraction who speak English fluently would rise by 35.3% over their lifetime.

The mean lifetime expected advances for different ages at arrival vary widely from the overall mean, with particularly large differences between cohorts arriving before and after the critical age for language learning. For this reason, we also calculate in Table A-4 the mean expected advance for Mexican immigrants who arrive before age 15, .698, and for those who arrive at older ages, .248.

²⁸ It is estimated as the difference between the end-of-decade attainment at the first observed age and the mid-decade attainment at the nominal age at arrival, which is estimated as the mean of the beginning and end-of-decade attainments for the given age and duration. Unlike the other advances in the table this is not a true cohort change but synthesized from attainments for different birth-arrival cohorts.

It is of interest also to compare these advances with the attainments of English fluency at first post-entry census in 1990, a population-weighted mean of .161 for all ages at arrival combined (Table A-4 column 2). Since these new immigrants have been in the U.S. for a mean of approximately 2.5 years²⁹ and the rate of advance for most variables is most rapid immediately after arrival, this observed level of attainment includes a substantial but unmeasured amount of advance in addition to the attainments as of immigrants' day of arrival. The mean lifetime expected advances plus the mean attainments at first post-entry census give us a mean *expected lifetime attainment* of 51.4% for Mexican-born immigrants of all ages at arrival. This can meaningfully be compared with the 29.3 % of all Mexican immigrants who spoke fluent English as of the 1990 census.

²⁹ This assumes a constant flow of new arrivals over the previous five years. Data from the 2000 census, in fact, annual arrivals of Mexicans increased sharply to a peak in about 1989, so the mean duration of post-1984 arrivals is probably, slightly less than 2.5 years.

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Figure 1

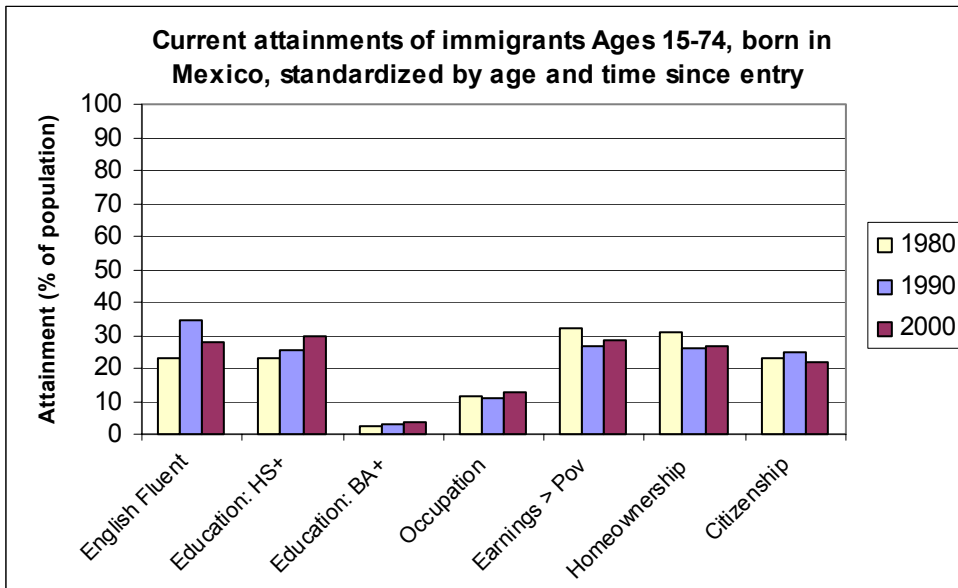


Figure 2

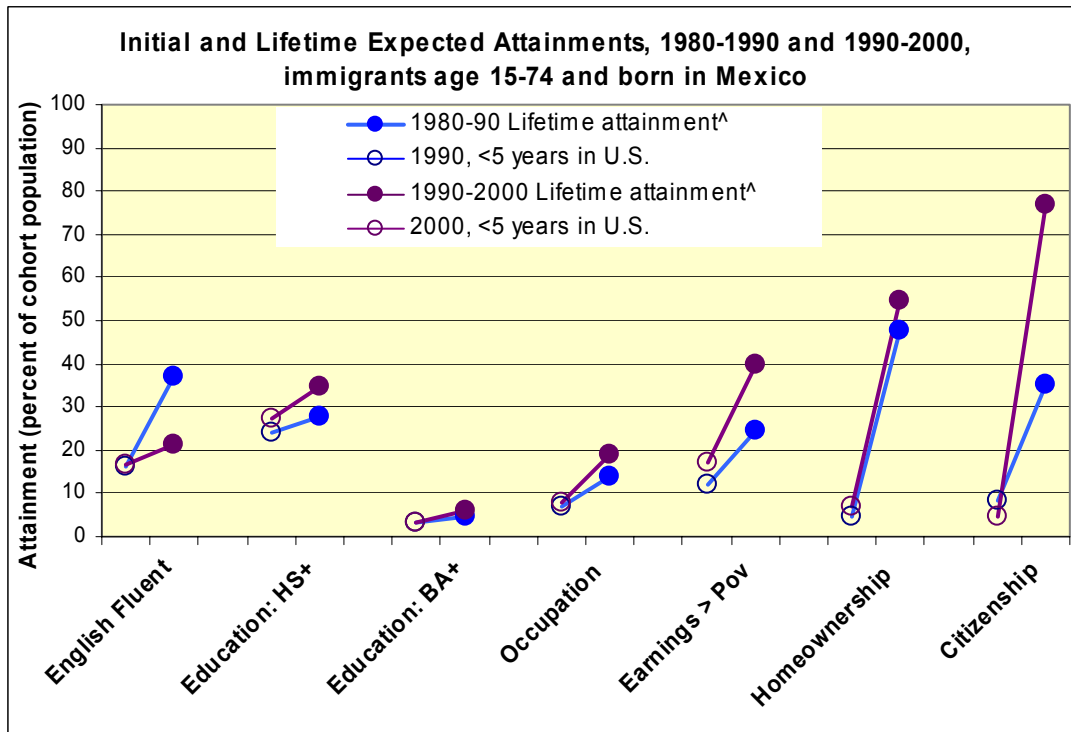


Figure 3

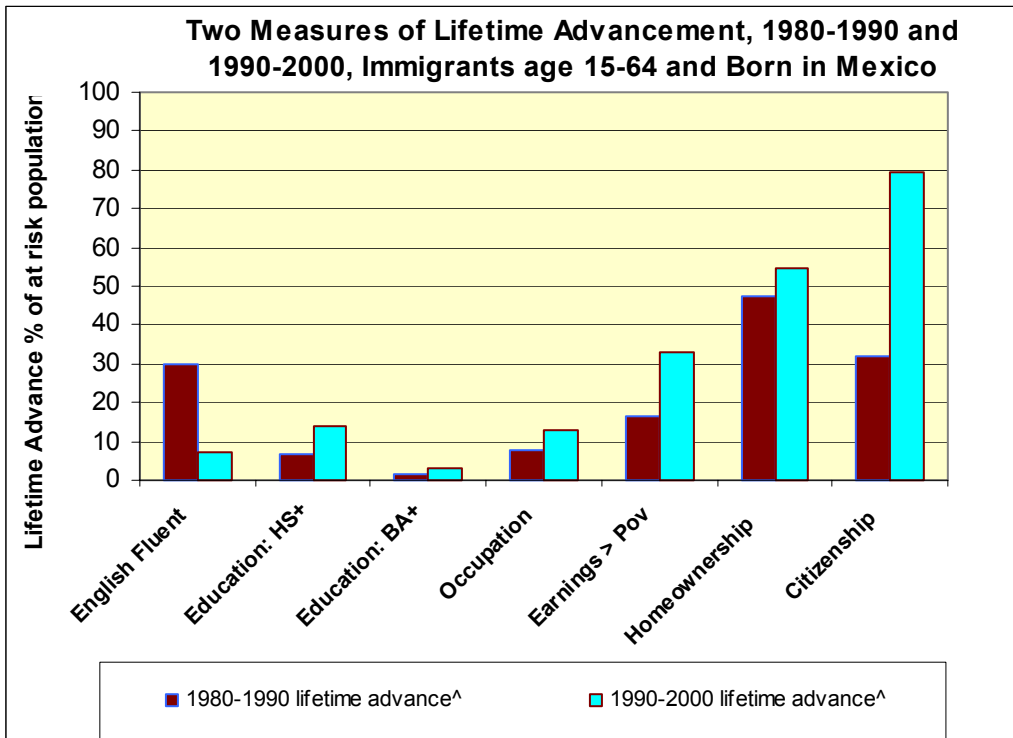


Figure 4

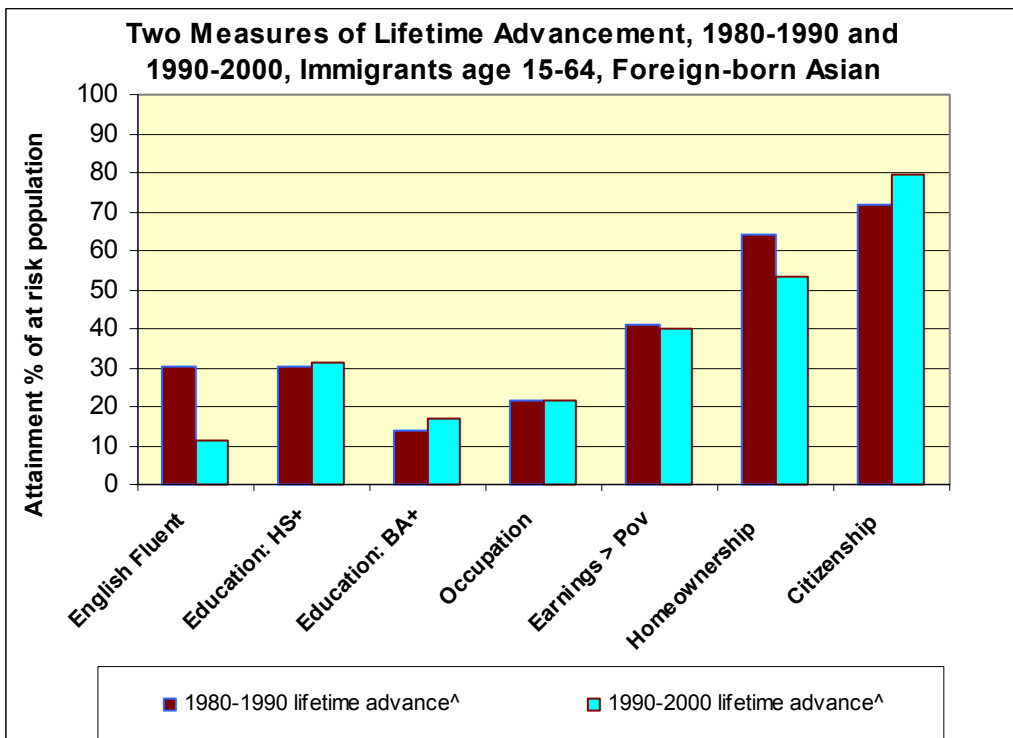


Table A-1. Change in Share English Fluent for Mexican Born Birth-Arrival Cohorts, 1980-1990
Cohorts that arrived in *second half-decade* (years ending in digits 5-9)

		Age in years, 1980																					
		0 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64									
		Age in years, 1990																					
		10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	70 to 74								
Age at arrival	10-year advance, 1980-1990												5-year advance, 1985^a-1990	Cumulative (lifetime) advance to Age 70-74									
<5	0.693 ^a	0.438	0.222	0.112	0.105	0.059	0.027 ^a												0.902				
5-9		0.666	0.295	0.137	0.093	0.105	0.009	0.059	0.045	0.027												0.828	
10-14		0.444	0.239	0.147	0.105	0.009	0.059	0.045	0.027												0.704		
15-19			0.189	0.171	0.074	0.009	0.045	0.027												0.419			
20-24			0.130	0.088	0.081	0.059	0.027												0.332				
25-29				0.099	0.071	0.065	0.045	0.027												0.263			
30-34					0.099	0.101	0.089	0.027												0.282			
35-39						0.060	0.052	0.050	0.017												0.168		
40-44							0.060	0.053	0.035												0.141		
45-49								0.000	0.000												0.000		
50-54									0.000	0.000												0.000	
55-59										0.000	0.000												0.000
60-64											0.000												0.000

^a The census does not report language use and ability for persons under age 5. Initial attainments for cohorts arriving before age 5 years are assumed to be zero.

Source: Calculated from tabulations of 1980 and 1990 U.S. Census 5% PUMS data. See text for details.

Table A-2. Change in Share English Fluent for Mexican Born Birth-Arrival Cohorts, 1980-1990
Cohorts that arrived in *first quinquennium* (years ending in digits 0-4)

		Age in years, 1980																
		0 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64				
		Age in years, 1990												Arrival age				
		10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	+5 years	70 to 74	5-year advance, 1985^a-1990	Cumulative (lifetime) advance to Age 70-74
Age at arrival	10-year advance, 1980-1990																	
<5	^a 0.638		0.387			0.137	0.093	0.009	0.045					0.391	^a 0.013	0.901		
5-9		0.513		0.318		0.147	0.105	0.009	0.059	0.027				0.389		0.858		
10-14			0.230		0.228		0.074	0.009	0.045					0.277	0.013	0.629		
15-19				0.144		0.096	0.081	0.059	0.027					0.088		0.406		
20-24					0.111		0.095	0.065	0.045					0.066	0.013	0.338		
25-29						0.089	0.091	0.089	0.027					0.053		0.305		
30-34							0.066	0.078	0.050					0.056	0.013	0.238		
35-39								0.081	0.108	0.035				0.059		0.256		
40-44									0.066	0.061				0.031	0.017	0.164		
45-49										0.000				0.057		0.057		
50-54											0.000			0.035	0.000	0.035		
55-59												0.000		0.067		0.067		
60-64															0.000			

^a The census does not report language use and ability for persons under age 5. Initial attainments for cohorts arriving before age 5 years are assumed to be zero.

Source: Calculated from tabulations of 1980 and 1990 U.S. Census 5% PUMS data. See text for details.

**Table A-3. Total Change in Share English Fluent for Mexican Born Birth-Arrival Cohorts, 1980-1990
All Cohorts**

<u>Age at arrival</u>	<u>Cumulative (lifetime) advance to Age 70-74</u>			<u>Initial share, 1990 (at age of arrival)</u>	<u>Arrival cohort Population, 1990</u>
	<u>First half-decade cohorts</u>	<u>Second half-decade cohorts</u>	<u>Mean all cohorts</u>		
<5	0.901	0.902	0.902	0.000	a. 94
5-9	0.858	0.828	0.843	0.206	109
10-14	0.629	0.704	0.666	0.248	82
15-19	0.406	0.419	0.412	0.180	179
20-24	0.338	0.332	0.335	0.162	313
25-29	0.305	0.263	0.284	0.165	201
30-34	0.238	0.282	0.260	0.160	102
35-39	0.256	0.168	0.212	0.158	53
40-44	0.164	0.141	0.153	0.154	33
45-49	0.057	0.000	0.028	0.135	25
50-54	0.035	0.000	0.017	0.165	16
55-59	0.067	0.000	0.033	0.161	10
60-64		0.000	0.000	0.141	8

^a. The census does not report language use and ability for persons under age 5. Initial attainments for cohorts arriving before age 5 years are assumed to be zero.

Source: Calculated from tabulations of 1980 and 1990 U.S. Census 5% PUMS data and Tables 2 and 3..

Table A-4 Share of Mexican-born Birth-Arrival Cohorts Fluent in English, Weighted by Population of Arrival Cohort

	<u>At first post-entry census</u>	<u>Cumulative (lifetime) advance to Age 70-74 Mean, all cohorts</u>	<u>Lifetime expected attainment (% of cohort population)</u>
Total	0.161	0.353	0.514
Arrive Under Age 15	0.150	0.698	0.848
Arrive Age Age 15 or older	0.164	0.248	0.413

Source: Calculated from Table 4, see text.